APPENDIX A

Statutory Provisions Involved

JURISDICTION OF THE COURT OF CLAIMS—PATENT AND COPYRIGHT CASES

28 U. S. C. 1498(a):

"(a) Whenever an invention described in and covered by a patent of the United States is used or manufactured by or for the United States without license of the owner thereof or lawful right to use or manufacture the same, the owner's remedy shall be by action against the United States in the Court of Claims for the recovery of his reasonable and entire compensation for such use and manufacture.

For the purposes of this section, the use or manufacture of an invention described in and covered by a patent of the United States by a contractor, a subcontractor, or any person, firm, or corporation for the Government and with the authorization or consent of the Government, shall be construed as use or manufacture for the United States.

The court shall not award compensation under this section if the claim is based on the use or manufacture by or for the United States of any article owned, leased, used by, or in the possession of the United States prior to July 1, 1918.

A Government employee shall have the right to bring suit against the Government under this section except where he was in a position to order, influence,

or induce use of the invention by the Government. This section shall not confer a right of action on any patentee or any assignee of such patentee with respect to any invention discovered or invented by a person while in the employment or service of the United States, where the invention was related to the official functions of the employee, in cases in which such functions included research and development, or in the making of which Government time, materials or facilities were used."

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CONDITIONS FOR PATENTABILITY; NOVELTY AND LOSS OF RIGHT TO PATENT

35 U. S. C. 102 (1952):

"A person shall be entitled to a patent unless—

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or

(c) he has abandoned the invention, or

(d) the invention was first patented or caused to be patented by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on

an application filed more than twelve months before the filing of the application in the United States, or

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or

(f) he did not himself invent the subject matter sought to be patented, or

(g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other."

CONDITIONS FOR PATENTABILITY; NON-OBVIOUS SUBJECT MATTER

35 U. S. C. 103 (1952):

"A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made."

COURT OF CLAIMS; CERTIORARI; CERTIFIED QUESTIONS

28 U. S. C. 1255 (1948):

"Cases in the Court of Claims may be reviewed by the Supreme Court by the following methods:

(1) By writ of certiorari granted on petition of the United States or the claimant;

(2) By certification of any question of law by the Court of Claims in any case as to which instructions are desired, and upon such certification the Supreme Court may give binding instructions on such question."

APPENDIX B

Opinions and Decisions Below

1. Opinion and Decision of the United States Court of Claims decided April 19, 1968—reported at 393 F. 2d 819—and containing Opinion of Commissioner, filed September 21, 1967.

(See opposite) ☞

In the United States Court of Claims

No. 181-63

(Decided April 19, 1968)

ERWIN-NEWMAN COMPANY v. THE UNITED STATES

H. Struve Hensel, attorney of record, for plaintiff. *Harry Cohen*, of counsel.

Alfred B. Engelberg, with whom was *Assistant Attorney General Edwin L. Weisl, Jr.*, for defendant.

Before COWEN, *Chief Judge*, LARAMORE, DURFEE, DAVIS, COLLINS, SKELTON, and NICHOLS, *Judges*.

OPINION

PER CURIAM: This case was referred to Trial Commissioner Donald E. Lane with directions to make findings of fact and recommendation for conclusions of law under the order of reference and Rule 57(a). The commissioner has done so in an opinion and report filed on September 21, 1967. Exceptions to the commissioner's report and opinion were filed by plaintiff, briefs were filed by the parties, and the case was submitted to the court on oral argument of counsel. Since the court is in agreement with the opinion, findings of fact, and recommended conclusion of law of the commissioner, as hereinafter set forth, it hereby adopts the same as the basis for its judgment in this case. Therefore, plaintiff is not entitled to recover, and the petition is dismissed.

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OPINION OF COMMISSIONER

LANE, *Commissioner:* This is a patent suit under Title 28 U.S.C. § 1498, in which plaintiff seeks to recover reasonable and entire compensation for the alleged unauthorized use of a patented invention. Plaintiff alleges infringement of claims 1, 3, and 4 of U.S. Patent No. 2,687,102, hereafter referred to as the '102 patent, entitled "Truss Support" and owned by plaintiff. Notices under Rule 23(a) were served on defendant's behalf on six construction companies. None of these possible third-party defendants participated in the trial of the issues of patent validity and infringement.

The issues before the court are whether the patent claims in suit are valid and, if so, have they been infringed. It is found that patent claims 1, 3, and 4 of the '102 patent are invalid.

The defendant raises as a defense, among others, that the claimed invention was obvious to one having ordinary skill in the truss art at the time the invention was made and therefore unpatentable under Title 35 U.S.C. § 103. This court recently pointed out in *Martin-Marietta Corp.* v. *United States*, 179 Ct. Cl. 70, 373 F. 2d 972, 153 USPQ 206 (1967), that application of § 103 involves several preliminary factual inquiries. These include determining:

1. The scope and content of the prior art;
2. Differences between the prior art and the claims at issue; and
3. The level of ordinary skill in the pertinent art.

The invention disclosed and claimed in the '102 patent relates to an essentially stationary structure for transmitting forces to a foundation or the ground. The structure includes a cantilever truss which is secured at its inner end to support means, and a rigid suspending member capable of taking tension and compression which extends from the support means to the truss at a point spaced from the inner end of the truss. In the '102 patent specification, the invention is described as particularly useful in aircraft hangar construction, and is said to have general utility in supporting building roofs, bridge structures, and the like. Claim 1 of the '102 patent is set forth below in indented clauses to facilitate analysis.

Patent Claim 1

In a structure,

(A) vertical supporting means,

(B) a truss secured at its inner end to said vertical supporting means and projecting outwardly therefrom, and

(C) means for suspending said truss from said vertical supporting means comprising

(C–1) rigid means capable of taking compression or tension disposed above said truss and secured to the latter at a point spaced from said inner end of the truss for opposing the turning moments of the truss in either of the two directions about the point of said securement of its inner end to said vertical supporting means,

(C–1a) said rigid means capable of taking tension or compression comprising a member secured to said vertical supporting means at a point spaced upwardly from the top of the truss at the inner end thereof and extending from said last mentioned point to said point of securement to the truss,

(B–1) said truss having a cantilever section projecting outwardly beyond said point at which said rigid means capable of taking tension or compression is secured to said truss.

A primary advantage of the claimed structure over ordinary cantilever structures is the relatively shallow depth for a given load-carrying capacity. This shallow truss results in lighter weight, lower steel costs for long roof trusses such as used in hangars, and ready portability because of the shallow depth. The length of cantilever trusses utilized in aircraft hangars genetally requires trusses of over 12 feet in depth fabricated on the job site where an ordinary cantilever truss is used.

In further support of its invalidity defenses, defendant has introduced various examples of prior art structures utilizing a suspended cantilever member. Among the disclosures of structural applications for a suspended cantilever member cited were bridges, finding 19, semicantilever airplane wings, finding 20, and airplane hangars, findings 17, 21, 22, and 23. Bridges, buildings, and hangars are specifically mentioned in the '102 patent as applications for the disclosed structural system. Aircraft framework comprises an application which is related to the structures specifically mentioned in the

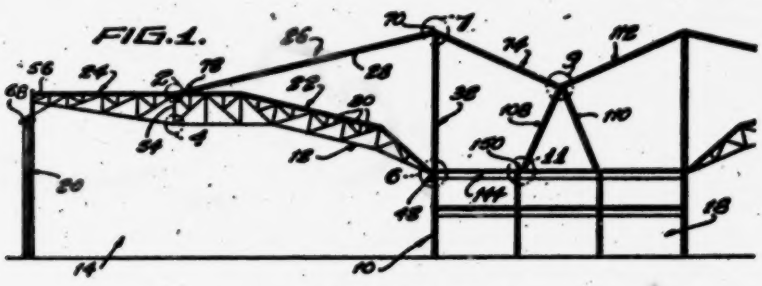
patent. Disclosures in an art such as airframe design may be used in considering the question of obviousness of an invention in the structural art since the elements and purpose of airframe design are so related that they would make an impression on the mind of a skilled structural engineer. See *Mandel Bros.* v. *Wallace*, 335 U.S. 291 (1948).

Except for the McDonnell patent discussed in finding 20, which discloses a strut for a semicantilever aircraft wing, the prior art relied on by defendant does not explicitly suggest that a suspending member for a normally horizontal cantilever means should be capable of taking both tension and compression.

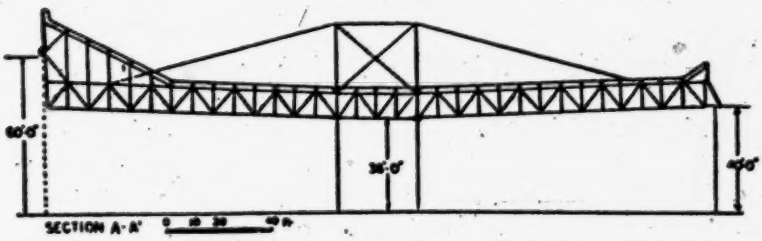
The differences which exist between plaintiff's claimed structure and prior art publications illustrating hangar designs are small. The French patent 747,560, discussed in finding 17, and the proposed designs published in The Federal Architect and Architectural Forum, discussed in findings 21 and 23, illustrate hangars which include the elements of the patent claims. Novelty in the asserted patent claims is limited to the recitation relative to capability of the rigid suspending member to take tension and compression.

The difference which exists between the claimed subject matter and the hangars of the prior art may best be seen by comparing Fig. 1 of the '102 patent and the published drawing in the March 1952 issue of Architectural Forum, which are both reproduced herein. The Architectural Forum drawing, a line drawing to scale, discloses a suspended cantilever truss system. The truss is relatively shallow (about 12 feet in depth) and projects outwardly from a central supporting tower. Attached to the truss at a point intermediate its ends and suspending it from the central support means is a member shown as a single line.

A line drawing such as that in the Architectural Forum publication indicates the manner in which space is enclosed by the structure and the relative disposition of the structural members. Given such a line drawing, a structural engineer can routinely design a structure for use in a particular environment. Sources such as building codes, design manuals, and engineering experience are used in selecting the design loading conditions. Routine stress analyses are made and



Patent 2,687,102



Architectural Forum, March 1952

members of the cantilever structure are sized according to the loads they have to carry. Use of a relatively heavy cantilever truss would result in designing the suspending member to take only tension. The concept of designing the suspending member to also resist compression where the dead-weight is insufficient to overbalance an uplift caused by air-flow is fairly disclosed in McDonnell patent 1,862,902, finding 20, which teaches the integration in a cantilever structure of a suspending member or a strut in an environment where the strut is designed to take compression. Significantly, McDonnell states that his suspended cantilever wing construction is strong and light in weight.

It is concluded after considering the difference between the subject matter of the claims and the prior art, that the subject matter as a whole would have been obvious to a structural engineer of ordinary skill at the time the invention was made.

In view of the above determination of invalidity under § 103, it is not necessary to discuss defendant's alternate positions that the patent is invalid because (a) anticipated and

(b) indefinite. It likewise is not necessary to discuss the question of patent infringement. Plaintiff's petition should be dismissed.

FINDINGS OF FACT

1. This is a patent suit arising under Title 28 U.S.C. § 1498 for reasonable and entire compensation for the unauthorized use by or for the United States of the invention set forth in claims 1, 3, and 4 of U.S. Patent No. 2,687,102, issued August 24, 1954, in the names of Paul I. Rongved and Cyral P. Erwin, assignors to The Erwin-Newman Company, for "Truss Support." Said company has been the owner of the patent in suit from said date of issue.

2. Plaintiff Erwin-Newman Company was at the commencement of this suit a partnership organized and existing under the laws of Texas, composed of Cyral P. Erwin and Richard J. Newman. On October 7, 1965, during the pendency of this action, Richard J. Newman died. Pursuant to a partnership agreement, the partnership survived and continues in the prosecution of this suit under the control of Cyral P. Erwin.

3. On behalf of the defendant, notices to possible third parties under Rule 23(a) were served on A. B. Newton and Company, Videlia, Georgia; Baldwin Contracting Company, Inc., Maryville, California; Frederick Construction Company, Inc., Frederick, Maryland; Jen-Mar Construction Company, San Diego, California; Morgen & Oswood Construction Co., Inc., Glasgow, Montana; and Siesel Construction Company, Milwaukee, Wisconsin. In a paper filed February 8, 1965, Jen-Mar Construction Company denied liability. In a paper filed December 30, 1964, A. B. Newton and Company adopted the answer filed by defendant United States and denied infringement liability. None of the noticed parties identified above participated in the trial.

4. Plaintiff and defendant United States have agreed to defer the trial of any accounting issues until after a ruling by the court on the issues of patent validity, infringement, and ownership of the patent in suit.

5. Plaintiff has not granted to defendant any express license, written or oral, nor consented to or acquiesced in the

making and use by defendant of any of the structures or structural forms described in or covered by any of the claims allowed in Patent No. 2,687,102 except a United States Coast Guard hangar located at St. Petersburg, Florida, and a Lockheed-Marietta hangar built in 1960 at Marietta, Georgia. Defendant has an implied license to use these hangars because of sales by the plaintiff.

6. The patent in suit discloses and claims structures which are designed to support a load. The patent specification and drawings specifically describe the invention with reference to a hangar installation, but the specification teaches that the inventive structure can be used to support building roofs, bridge structures, and the like.

7. Several technical terms listed in this report are used in the following manner. A structure is a machine wherein the component elements are stationary rather than movable. The function of a structure is to transmit forces, usually through a foundation or to the ground. A cantilever structure includes a horizontally extending member which is supported or anchored at one point and free at the other. The ability of a structural member to take compressive force without failing or buckling is a function of several design criteria including the nature of the material selected and the cross sectional area of the member in a plane perpendicular to the compressive force. Another factor used to determine the ability of a member to withstand compression is the slenderness ratio. This ratio compares the length of the member to its radius of gyration and is sometimes referred to as the l/r ratio. An l/r ratio reflects the rigidity of a member, its ability to avoid buckling or bending upon the application of a compressive force. Construction codes set maximum values for the l/r ratio of primary and secondary compression members. These code values for allowable l/r ratios represent limits for the design choice of structural engineers.

8. A line drawing such as that shown in Architectural Forum for March 1952, and reproduced in the opinion, forms the starting point for a structure, and such a drawing indicates the manner in which space is enclosed by the structure and the relative disposition of the structural members. A structural engineer designs a structure to withstand dead

loads imposed on the structure by its weight, and live loads such as snow and wind. Among the live loads which may be imposed on the roof of an aircraft hangar is an upward force termed wind uplift. If such an upward force is larger than the weight of the structure, the uplift must be resisted and transferred to the ground. The force of wind uplift on the roof of a structure may be greater than the force of the wind acting in a horizontal direction against the structure. Many building codes specify that the design wind uplift is 1.25 times the maximum expected wind force acting in a horizontal direction against the structure. Wind uplift forces of this magnitude occur if the structure provides for confinement of the wind as by vertical walls. In hangars utilizing ordinary cantilever trusses for roof support, the weight of the cantilever truss and roof exceeds the design wind uplift force. Design, as used in the foregoing sentence, refers to the extreme conditions of live loading set forth as a design standard in the applicable building code.

9. The structure defined by the patent claims here in suit comprises four main elements. With reference to the numbering system utilized in Fig. 1, which is reproduced in the opinion, these claimed elements are as follows:

(A) vertical supporting means which includes column 32, and the members 74, 108, and 110,

(B) a truss 12 secured at its inner end 42 to the vertical supporting means,

(C) rigid means 26 for suspending the truss 12 from the vertical supporting means 32 comprising rigid member 28 capable of taking compression and tension, and

(B–1) a cantilever section 24 of the truss 12 which projects outwardly beyond the point 72 where the rigid means 26 capable of taking tension and compression is secured to the truss 12.

10. According to the '102 patent specification, the structural system consisting of the four elements described above functions so that when downward forces such as the weight of the roof are applied to the truss 12, member 28 will be in tension. When upward forces such as wind uplift are applied to the truss 12, member 28 may be put in compression. By making member 28 capable of taking compression to

compensate for upward forces on the truss 12 rather than utilizing the weight of the roof and the truss itself, the structure can be made lighter. This results in a cost saving in the price of materials. Another advantage of the alleged invention which is disclosed in the '102 patent is the capability of using cantilever trusses of relatively shallow depth. Trusses of shallow depth can be prefabricated and shipped to the work site. Trusses of greater depth must be assembled on the work site which results in increased costs. Another inherent advantage of a shallow truss used to support a hangar roof is the decreased enclosed volume which must be heated.

11. Patent claim 3 differs from claim 1 set forth in the opinion in two respects. Claim 3 recites that the truss comprises framework members connected to each other and does not call for the cantilever section 24 recited in claim 1. Claim 4 resembles claim 1 but more specifically defines a portion of the vertical supporting means recited in claim 1, by referring to it as a vertical column. This member, according to claim 4, is "subjected to the horizontal component of the force of the truss." Claim 4 also includes means for opposing said horizontal component of the force of said truss against said column, such as provided by member 144 in Fig. 1. All of these specific recitations in claim 4 are parts of the traditional cantilever truss which admittedly comprised part of the prior art.

12. The specification and contents of the prosecution file of the '102 patent establish that the novel aspect of the alleged invention is the integration of the rigid suspending member numbered 28 in Fig. 1, capable of taking compression or tension into a cantilever structure. The patentees consistently argued before the Patent Office examiner that the rigid member distinguished the claims over prior art cantilever structures because this member allows use of a shallow cantilever truss. The patent specification provides no explanation of the meaning of the phrase "capable of taking compression or tension" beyond the words themselves. Plaintiff urges a narrow reading of this phrase which is consistent with the patent specification and file history. It is found that the claimed invention does not extend to cover structures including a suspended cantilever truss if the built-in deadweight of

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the structure is sufficient to resist all existing and expected forces tending to place the suspending member in compression. When given this interpretation, the claims are not anticipated by or infringed by a suspended cantilever structure having a rigid suspending member if the design forces for said structure could not produce compression in the suspending member.

13. Previous to the making of the alleged invention, disclosed in the '102 patent in suit, suspended cantilever roof structures for airplane hangars had been built on the principle that the deadweight of the horizontal truss members and roof thereon would be of sufficient magnitude to overcome any possible uplift forces. In these prior designs, suspending means would be subjected only to tension. For many years before the Erwin-Rongved development, it was known that a cantilever hangar is advantageous and desirable for two reasons, (1) the cantilever design eliminates obstructions to movements of the aircraft into and in the hangar, and (2) the length of such a hangar can be easily increased by removing one end wall and extending the length of the cantilever roof.

14. The alleged invention disclosed in the '102 patent was jointly made in the fall of 1952 by Cyral P. Erwin, who had been working on airplane hangar designs for over 10 years, and by Paul I. Rongved, who was first employed by plaintiff in September 1952. The development resulted from a request for a design for Hangar No. 7 for Lockheed Aviation Company at Kennedy Airport. Due to the size of the proposed hangar, the weight and cost of a standard cantilever construction were considered prohibitive. After being told that Lockheed could not afford the cost of a standard cantilever roof support structure, C. P. Erwin and P. I. Rongved endeavored to eliminate members of a standard cantilever truss design. The testimony is explicit as to the inventive process employed. The new hangar design was of light weight and yet was able to resist wind uplift without providing built-in, uplift-resisting dead load.

15. Aircraft hangars which utilize the alleged Erwin-Newman invention have been commercially successful. Many hangars have been constructed by plaintiff for private corpo-

rations. Plaintiff has submitted in evidence seven publications which give the invention favorable comment. The Navy Bureau of Yards and Docks adopted as a standard the suspended cantilever design illustrated in the '102 patent after a careful study and engineering analysis.

16. At trial of the validity issues, defendant relied upon 6 prior patents and 21 prior publications. In addition, defendant presented evidence with respect to one prior use and with respect to two alleged prior designs. Much of the prior art relied upon by defendant was introduced to demonstrate that the structural system described and claimed in the patent in suit was useful in situations presenting structural problems in some way related to airplane hangar roof construction. Some of these prior patents and publications are not discussed in the following findings because they have a more remote relation to the level of ordinary skill in the structural design art than the specific prior materials discussed below. Defendant has alleged the claims are invalid under Title 35 U.S.C. §§ 102 and 103. No single reference cited by defendant discloses the specific structural combination recited by the claims in suit to invalidate said claims under section 102.

17. French patent 747,560, to Entreprises Limousin, published in 1933, describes a suspended cantilever truss used to support the roof of an airplane hangar. A hangar utilizing the design of this patent was built at the Lyon-Bron Airport in France. Defendant's exhibits 24 and 25 are publications describing and illustrating the as-built hangar. The elements of the asserted patent claims have counterparts in the structure described in the above exhibits. Only the capability of the suspending member to take compression is absent from the teachings of these exhibits. The suspending members as described in said French patent are a plurality of bare irons or metal cables encased with concrete to protect the metal from the weather. While the supports described by the French patent are capable of taking some compression forces, there is no evidence that they were designed to take compression or would ever in fact take compressive forces caused by wind uplift. The deadweight of the truss and the roof illustrated are of a magnitude which exceeds reasonably expected wind uplift forces.

18. British patent 554,327, granted to Hardy & Padmore, Ltd., in 1943, is the only prior art patent or publication relied upon by the defendant which was cited by the Patent Office during the pendency of the application which issued as the '102 patent. This patent describes a shelter to protect queues of people from rain. It discloses a braced cantilever framework used to support the sheet metal roof of the shelter which is open, i.e., the shelter has no side walls. The patent has no specific teaching relating to the suspension of a truss by means capable of taking compression or tension. In other respects, the British patent disclosure includes the elements of the asserted '102 patent claims.

19. The early patent to Strauss, No. 974,358, issued in 1910, relates to a pivotally movable bascule bridge structure which is raised about a pivot by gearing. The Strauss bridge construction provides a pivoted truss which spans the gap and which is cantilever when raised to the open bridge position. A rigid link connects the moving truss with its counterweight. This link is disclosed to act as a tension member during initial movement of the leaf away from its horizontal position and subsequently as a compression member.

20. McDonnell patent 1,862,902, issued in 1932, discloses structural framework for a semicantilever airplane wing. One of the objects of this patent is to provide a strong, light, and compact wing construction adequately safeguarded against mishaps in handling. A rigid rectangular frame which forms part of the aircraft fuselage is used to support wing beam members which project out from the fuselage. Struts which are capable of taking tension and compression extend outwardly from the rigid rectangular frame at a point spaced upwardly from the top of the wing beam members and are secured to the wing beam members at a point spaced from the inner end of the wing beam members. The McDonnell patent discloses elements which correspond to elements of the asserted patent claims in a structural combination which functions in a manner similar to the structure claimed in the '102 patent. Differences in the configuration and ultimate function of an aircraft wing and a hangar roof support require finding that the McDonnell patent above does not anticipate the patent claims here in suit.

21. A proposed cantilever hangar construction resulted from calculations and sketches by H. B. Zackrison in 1937, defendant's exhibit 34. An architectural rendering of said proposed hangar was published in The Federal Architect for October 1938, defendant's exhibit 23. The Zackrison calculations and sketches were not published or made publicly known, and no hangar was built from the specific Zackrison design. The Zackrison calculations are relevant to the issue of average skill in the design of aircraft hangars. The publication in The Federal Architect does not explicitly teach that a suspending member located above the roofline of a cantilever hangar should be capable of taking compression. This published architectural rendering suggests to one skilled in the art a means for reducing the depth of a cantilever roof support truss for an aircraft hangar.

22. The proposed hangar as designed by Zackrison utilizes a suspended horizontal cantilever truss to support the roof. The horizontal truss is partially suspended by suspending members positioned above the roofline of the hangar. The calculations reveal that the horizontal truss varies in depth from 12 feet to 22 feet. The dead load of the proposed structure exceeded the design wind uplift force. Zackrison's suspension members were not designed to take compression although they would in fact resist compressive force. The l/r ratio of the members was 184, an acceptable value for secondary compression members. The l/r ratio of a member is one factor to which a structural engineer looks in determining the ability of a member to stand compression forces. The calculations made by Zackrison illustrate the standard engineering practice of analyzing the magnitude of forces induced in the structural members by the design live loads which are set forth in the applicable building code. In accordance with this practice, Zackrison took wind uplift into consideration. The calculations, however, indicate that the suspending member would be subjected only to tension.

23. A steel frame aircraft hangar including a suspended cantilever roof truss is disclosed in the March 1952 issue of Architectural Forum, defendant's exhibit 32. The line drawing, partially to scale, relied on by defendant, is reproduced in the opinion. The suspending members are shown as

a single line which provides no indication of whether they would or would not take compression forces. In other respects this drawing discloses the subject matter of the asserted patent claims. A shallow truss, approximately 12 feet in depth, is depicted in the line drawing. An article on steel-framed aircraft buildings published in Steel Construction Digest, January 1950, defendant's exhibit 31, includes a line drawing which corresponds to the drawing disclosed in the 1952 Architectural Forum publication and the 1937 Zackrison calculations.

24. Defendant has urged that a truck loading dock constructed for Transcon Lines Company in Los Angeles, California, constitutes a prior use of the invention. It is found from the evidence presented that construction of this building was not completed until after the filing date of the '102 patent in suit. The plans and specifications for the Transcon loading dock became publicly available on February 26, 1952, upon filing an application for a building permit. However, this public availability was not accompanied by any notice of the existence or location of the plans.

25. The cantilever roof design of the Transcon truck loading dock, shown in defendant's exhibits 33–A, 33–B, and 33–C, resulted from calculations, defendant's exhibits 41–A–B–C, made in January 1952 by William F. Ropp, a structural engineer. These calculations show that a structural steel section was designated as a suspending member. Such a section would take first tension and then compression forces when subjected to the dead load and then to the wind uplift force set forth in the applicable building code provided the structure included walls. The Transcon design loading dock was not walled. The l/r ratio for the suspending section at Transcon was well above the maximum allowed by the local building code for a compression member. Plausible reasons for Transcon selection of a structural steel section for the suspending member are appearance and ease of making connections. The Ropp calculations have not been used in determining the issue of obviousness because at least part of the matter therein was added after 1952.

26. Copies of engineering drawings, defendant's exhibits 37 and 37–A, prepared by the Roberts and Schaefer Co. in

1949, disclose a braced structural steel cantilever truss for use in an aircraft hangar. The truss-suspending member is depicted by a double line which ordinarily denotes a rigid member. It is impossible to determine whether this member was designed to be capable of taking compression. The witness who discussed copies of these drawings did not personally prepare them and had never seen the original drawings. The Roberts and Schaefer drawings were not made public. These drawings are not admissible as a prior art reference; and uncertainty as to the originator renders them inadmissible to show the level of skill in the art. No weight has been given to the Roberts and Schaefer drawings in determining the obviousness of the patent claims.

27. It is found after considering (a) the prior suspended cantilever aircraft hangar roofs and publications relating thereto described in finding 17; (b) the prior teachings of a cantilever member in other load-carrying applications having a rigid suspending member capable of taking tension and compression as described in findings 19 and 20; (c) the published design of a suspended relatively shallow cantilever truss for use in an aircraft hangar described in finding 23; and (d) the calculations of Zackrison, described in finding 22, which reflect the practice of structural engineers, that it was *obvious* to one skilled in the art as of December 1952 to combine structural elements as recited in the asserted patent claims. Claims 1, 3, and 4 of the '102 patent are invalid under the provisions of 35 U.S.C. § 103.

28. Defendant alleges that the claims are invalid under Title 35 U.S.C. § 112 for failing to point out and distinctly claim the subject matter which the applicant regards as his invention. It is found from a reading of the '102 patent specification that the phrase in the claims "capable of taking tension and compression" does not refer in the abstract to the individual members recited in the claims. The patent claim language when given a reasonable interpretation requires that the rigid suspending means be capable of resisting tension and compression in relation to the claimed structure. The capability of a member to take compression and tension is information which may be routinely obtained from building codes and design manuals. It is found that the

patent claims in suit particularly point out and distinctly claim the invention.

29. Defendant has, since August 24, 1954, and within 6 years prior to the filing of the petition, caused to be built or used aircraft hangars located at the Naval Air Station, Boca Chica, Florida, Butts Air Force Base, Fort Carson, Colorado, the National Auxiliary Air Station, Meridian, Mississippi, and the Naval Air Station at Andrews Air Force Base, Maryland. These aircraft hangars were, by agreement between the parties, selected as typical structures to determine the use and infringement of patent 2,687,102 by the defendant, without any waiver of the plaintiff's rights to cite other hangars at any accounting proceeding.

30. Defendant has not paid plaintiff any compensation for the aircraft hangars referred to above. Plaintiff notified defendant in writing by letter dated August 19, 1959, to the Department of the Navy, Bureau of Yards and Docks, of the claim by the plaintiff that defendant was without any license or right using the invention covered by patent 2,687,102. Plaintiff pressed its claim against the Department of the Navy for compensation until such claim was denied by a letter dated March 27, 1963, from the Secretary of the Navy. Hangars built by or under the authority of the plaintiff have been marked with the number of plaintiff's patent here in suit as provided for in the provisions of Title 35 U.S.C. § 287.

31. To determine whether the suspending members of the accused hangar structures are capable of taking tension and compression, analysis of the forces likely to be applied to such members and the relation thereof to the respective dead loads are necessary. The capabilities of a suspending member to take tension and compression is determined by computation of the slenderness ratios, i.e., l/r, the length over radius of gyration. The approved structural engineering practice in the United States, as set forth in building codes, is to calculate the design wind uplift force on a horizontal surface of a structure by multiplying the expected horizontal wind force in pounds per square foot by a factor of 1.25. The current American Steel Construction Manual, issued by the American Institute of Steel Construction, provides that the l/r of compression members shall not exceed 200. If a com-

pression member is ordinarily subject to shock or vibration, the maximum allowable l/r ratio is 120. It is found that the suspending members in the accused hangars are not ordinarily subjected to shock and vibration.

32. The defendant's aircraft hangar built at the Naval Station, Boca Chica, Florida, contains all of the elements of plaintiff's alleged invention as defined in claims 1, 2, and 4 of the '102 patent, and the main suspending member is capable of taking the required tension and compression expected to be applied to it in its designed structural environment. The suspending member has an l/r of 121. The design uplift force used by the designer of the Boca Chica hangar exceeded the deadweight of the roof structure.

33. The aircraft hangar built at Butts Air Force Base, Fort Carson, Colorado, contains all of the elements of plaintiff's alleged invention, and the suspending member is capable of taking the required tension and compression expected to be applied to it in the design structural environment. The suspending member has an l/r of 164. The suspending member could be expected to encounter an excess of wind uplift force over the existing dead load.

34. The aircraft hangar built in 1959 at the National Auxiliary Air Station, Meridian, Mississippi, contains all of the elements of plaintiff's alleged invention. The suspending member is capable of taking the required tension and compression expected to be applied to it in its designed structural environment. The supporting member has an l/r of 170 and could be expected to encounter an excess of wind uplift over the existing dead load.

35. The testimony of the structural engineering expert offered by the defendant in opposition to the allegation of patent infringement by typical hangar structures was not persuasive. His opinion that the hangars at Fort Carson, Colorado, Andrews Air Force Base, Maryland, and Meridian, Mississippi, were not intended by the designers thereof to include suspending members capable of taking compression was based on the contention that there was an absence of compression calculations by the designers and that batten or tie plates as used in said hangar structures were never used in connecting compression members. The designer of

the Andrews Air Force hangar did make calculations of compressive forces for one of the main supporting members. A number of structural engineering authors and authorities in available textbooks describe batten or tie plates as suitable for use in compression members. The supporting members in all three hangar structures were in fact capable of resisting compression as well as tension forces.

36. In summary, it is found that claims 1, 3, and 4 of plaintiff's '102 patent are invalid, but if they are valid, they have been infringed by each of the four typical aircraft hangars used by defendant.

Conclusion of Law

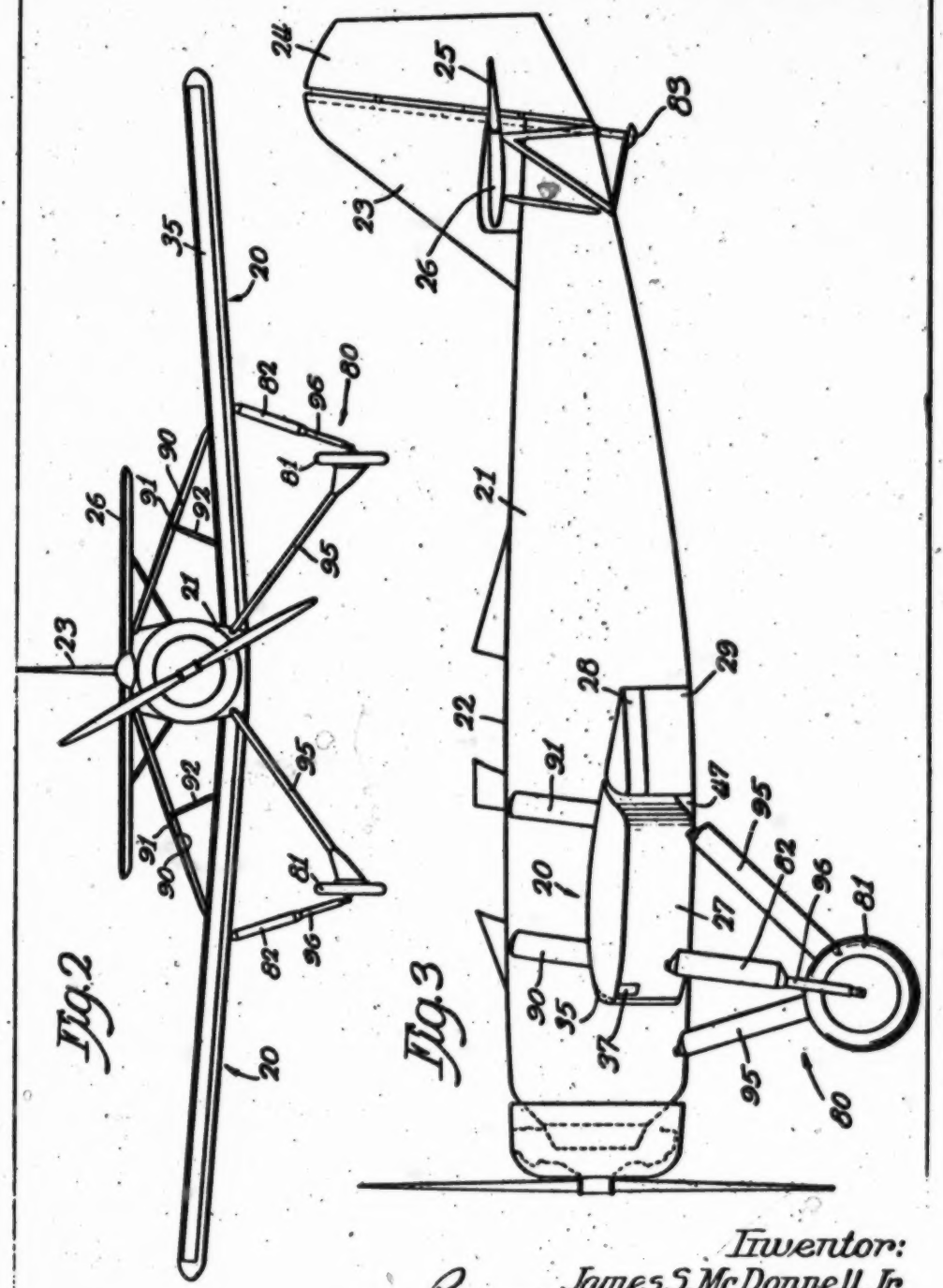
Upon the foregoing findings of fact, which are made a part of the judgment herein, the court concludes as a matter of law that plaintiff is not entitled to recover, and the petition is dismissed.

1. Pertinent Drawing and Excerpt from U. S. Patent No. 1,862,902 issued June 14, 1932 to J. S. McDonnell:

June 14, 1932. J. S. McDONNELL, JR 1,862,902

AIRPLANE

Filed Aug. 23, 1930 6 Sheets-Sheet 2



Inventor:
James S. McDonnell Jr.
By Rector, Hibben, Davis & Macauley Attys.

Patented June 14, 1932 1,862,902

UNITED STATES PATENT OFFICE

JAMES S. McDONNELL, JR., OF CHICAGO, ILLINOIS

AIRPLANE

Application filed August 23, 1930. Serial No. 477,252.

* * * * *

Excerpt from page 6 of Patent, lines 112 through 128:

"The specific relation of the landing gear to the wing and fuselage-frames here shown is especially rugged, particularly in its distribution of stresses in laterally tilted landings. In landing the thrust communicated through the shock absorber 82 *puts* the forward wing beam 88 under tension and its connected *strut 90 under compression,* wherefore said strut is made straight; the connecting strut 92 between these parts resisting deflection of the straight main strut 90 in either direction. The rear wing-beam 89, being but little affected by landing conditions, has its strut 91 upwardly cambered, and the connection 93 between these parts effectively conditions them to jointly resist deflections under flight-loads."

* * * * *

2. Excerpt from Cross Examination of Plaintiff's Expert, Professor Raymond Fox, Tr. 1140-1151, inclusive.

[1140] Mr. Hensel: The record will show I agree, but I am telling you what my notes show.

The Witness: Well again let me say that the arrangement here, again in terms of the reading material, is sort of a package, because one can't look just at this—

Mr. Cohen: When you say "this," Professor Fox, would you explain.

The Witness: The Figure 1 in the patent in suit— (continuing) and know just what is intended. If I were in, let's say, a meeting with an architect, serving as his engineer, and his client was there to discuss the enclosure of space, sketches alone do not completely indicate what has transpired and the resulting sketch.

By Mr. Platt:

Q. I understand that, Professor Fox. We were talking, if you recall, about Figure 1 alone and about what an articulation of a design might be, and you described how someone could take Figure 1 of the patent in suit, decide the particular area—you will recall we discussed building such a structure at National Airport, and you told us how you can go to the local codes and determine what the loads are, the deadloads, the wind loads, the liveloads, the soil in that particular area, and from this information which one could glean in this manner you could then perform a [1141] stress analysis on the member, having only Figure 1 of the patent in suit as a starting point, and then determine the sizes and shapes of all the members and the types of members to use. Now you recall going through that, don't you? A. Yes. I can't remember certain specific details in the early stage of how this came about though.

Q. What do you mean by "this"? A. The Figure 1, or this configuration. In other words—

Q. Well as you will recall we discussed—I suggested that your client handed you this sketch and you said that would be unlikely. A. Yes.

Q. But let's just assume we had the sketch. A. Okay, assume—

Q. You do remember that, don't you? A. So that eliminates the stage that I was saying was so important. In other words, perhaps—and this is perhaps one of the reasons why architects are considered rather highly, at least many of them, in the profession is because this determination of the concept is perhaps the most important part of the whole design, so—

Q. Now by that you are referring to Figure 1 of the patent in suit? [1142] A. Well the actual effort to determine what are the loads that the system must withstand, what are the purposes of the structure, and what is an attractive and efficient arrangement, this is why I guess I resisted the assumption which to me in a sense is rash, but from an attorney's viewpoint is sound, where just to say well here's something, an architect and an engineer don't function just this way, and so this is perhaps why I have the problem now. The phrasing, as I recall, was that—or, just assume this was handed?

Q. Well that's right. A. Well see you have wiped out, I would say, a great portion of the design thinking there. This is—so you want to eliminate all this thinking?

Q. Well for purposes of this cross examination you may answer the questions the way they are phrased, and if you wish to qualify your answer in any way you have that privilege.

Mr. Hensel: I think he has also the right, Mr. Commissioner, to add whether or not the question makes any sense in structural engineering.

By Mr. Platt:

Q. Now let's turn to Defendant's Exhibit 32. Now it is true, isn't it, that Defendant's Exhibit 32, the [1143] sketch in the upper right-hand portion thereof, is actually more detailed than Figure 1 of the patent in suit, isn't it? A. Well it has a couple dimensions on it.

Q. Which are not present in Figure 1 of the patent in suit? A. That's right.

Q. It also has a scale, doesn't it? A. Well yes, we can get the rough scale of the thing.

Q. Now let's assume the same thing we assumed with respect to Figure 1 of the patent in suit, that somebody gave you this sketch appearing in the upper right-hand portion of Defendant's Exhibit 32, and asked you to complete the design for such a structure, let's say, as an airplane hangar here at National Airport, now as you testified about Figure 1 of the patent in suit, wouldn't it be true that the first thing you would do is investigate the local conditions prevailing in this area? A. The loadings and things such as this, yes.

Q. You would look at the codes then and see what wind loads should be expected, and what the building codes require with respect to wind loads? A. Yes.

Q. And then you would perform a stress analysis; [1144] isn't that right? A. Yes.

Q. Now if as a result of your stress analysis you found that the member marked 28^1 in Defendant's Exhibit 32 were required to take tension forces and compression forces I assume you would use a member which would be capable of withstanding those forces, would you not? A. Well before we get to that though, I think in taking up the items of the loads I would get to the point that in deter-

mining the deadload I could very easily provide and assume, because of the magnitude of the truss, sufficient deadload that there would be no upward forces. This could be a very rational design and has been done.

Q. You could assume that? A. Oh, yes, I have to assume some deadload.

Q. I understand that. Well tell us what's the scale of the depth of the truss shown in that figure?

Mr. Cohen: Which part, Mr. Platt?

Mr. Platt: The truss.

Mr. Cohen: Well the truss seems to vary in depth.

Mr. Platt: Well perhaps Professor Fox can tell us then.

The Witness: At one point it's 30—

By Mr. Platt:

[1145] Q. Now what point are you talking about? A. Out at the outer end; at the inner end it's—

Mr. Cohen: It is 30 what, Professor Fox?

The Witness: Thirty feet deep.

By Mr. Platt:

Q. Are you talking about that little section that sticks up at the left-hand portion for providing a covering for the tail section? A. Yes, the—

Mr. Cohen: How do you know that's a little section, Mr. Platt?

The Witness: Then at the column it's about—it's between 11 and 12 feet deep.

By Mr. Platt:

Q. What's the depth throughout most of the length of that truss? A. I would say about 12 feet.

Q. That's a relatively shallow truss, isn't it? A. Yes, but again I can't say what would be the weight of the truss.

Q. Well wouldn't you be able to compute rather closely the deadload of that truss once you had this sketch and you were able to measure the approximate depth of the truss? [1146] A. I wouldn't say that. For example there's no indication—let's say there isn't a clear indication of how many trusses are in here, so that I might have relatively heavy trusses because they pick up relatively wide expanses of the roof. I would not say I can compute accurately the deadload there.

Q. Well as a structural engineer could you estimate it? A. Well I would estimate something, go through the design, and then compare my design with my estimate and refine it in that manner, but again there's nothing here to indicate how many—what would be the arrangement of the trusses. There's just a plan shown here, showing the fitting of apparently aircraft in there.

Q. That is a sectional view though, taken through Section AA? A. Section AA, yes, sir.

Q. AA^1. A. Yes, that's an odd way of doing it.

Q. Now say after you made your first estimate of the deadload you found that the wind uplift would be greater than the deadload, and your stress analysis showed that the member 28^1 would be subjected to compression as well as [1147] tension, what kind of member would you choose to use as that member 28^1?

Mr. Cohen: Is this question also based on an assumption?

Mr. Platt: I think that question is perfectly clear.

Mr. Cohen: Well I would like to hear the question.

(Pending question read.)

Mr. Cohen: I object to the question unless it is made clear that this is based on an assumption that he found that the deadweight was less than the uplift.

The Commissioner: As I understand the question it says if you find that there is a net uplift, so I would interpret that as being an assumption.

The Witness: Well now again I get into a problem. On the basis of the patent in suit, I am familiar with hangars that can take a member up there and provide tension and compression, so—

Mr. Platt: I am not talking about the patent in suit.

Mr. Hensel: Let him finish.

The Witness: Yes, but this influences my thinking at this stage. I can't help but realize that this can now be done. At the time I may, and it would depend upon the magnitude of the forces involved, I may have just put in some extra weight.

By Mr. Platt:

[1148] Q. Do you mean to tell us that before you read the patent in suit you had never heard of a member that was capable of a reversal of stresses? A. I didn't say that.

Q. Well what are you trying to tell us? A. Well I'm saying that the state of knowledge could be interpreted as saying that for such a long member, and depending upon the magnitude of the forces that would be involved, I could very easily add a rearrangement of the weight in the truss, the framing, such that I would not have the uplift. I can't help but say that this could be a solution and could be an efficient solution.

Q. Well considering your knowledge, your previous knowledge of members capable of taking both tension and compression in a reversal of stress, and if you found that from your stress analysis of the design articulation shown here in Defendant's Exhibit 32 that the member 28^1 could be subjected to such stresses, wouldn't that also be a rational way of solving that problem? A. Well all I can say is that it's rational as I look at it now, and yet the evidence that I have looked at—it is not indicated that this had been done as of that time. I can't think that I would have been any brighter than other people thinking at that time, so I would think that I may [1149] have provided—you see this is, let's say, a stage in the design, so things, proportions can change as we are progressing to the final drawings.

Q. Well, Professor Fox, I am afraid you really haven't answered the question.

Mr. Hensel: I think he has answered it perfectly.

The Commissioner: Phrase a new question, Mr. Platt. I thought the answer was pretty direct.

Mr. Hensel: Direct and clear.

By Mr. Platt:

Q. The question was directed to consideration of this drawing alone. Now this drawing was available to you prior to the time you had ever seen the patent in suit. Now the question was also phrased so as to ask you to make certain assumptions. One was that you found from calculation of the deadload that the wind uplift exceeded the deadload, and looking at this sketch and nothing else and making a stress analysis you found that the member designated only as a line, schematically, in Defendant's Exhibit 32, that member as being 28^1, would be subjected to conditions where it might undergo a reversal of stress, that is both tension and compression forces. You have told us that you were previously familiar with members which were capable of taking both tension and compression and structures which [1150] used such members.

Now I would like you to, on the basis of those assumptions and that statement of the problem, to tell us whether it would not be a rational solution to the problem, the reversal of stresses in the member 28^1, to use a member capable of taking both tension and compression?

Mr. Hensel: I submit that he answered the question, just that one.

The Commissioner: Let him answer it once more.

The Witness: Well again I guess I'm afraid of general questions, because as an engineer I tend to want to be specific. Specifically, tension and compression members, the type that have alternating stresses, are predominantly in instances for example where they are the web members here in the—in a truss, not in this particular truss. The occurrence of something like this is somewhat different and it

would depend entirely upon the magnitude of those forces of that as to just what would be the solution. Again I can't help but say that as of that time—

By Mr. Platt:

Q. As of what time? A. As of the time of—well this is March 1952; as of that time, looking at, let's say references that I am [1151] familiar with, because an engineer would not look at just this, he draws upon all the experience, the articles that he happens to have read, and things such as this. So considering all the items, let's say up to that date, I really can't say that I would choose a compression-tension member for that, because of the fact that I had not seen evidence that this had been done, and so my thinking process may be to arrange the member such that there's slightly greater deadload, some connection—since this is a continuous truss, an arrangement so that the connections can resist that by taking the forces, rather than in that, but that actually the small amount of uplift that might exceed deadload could be taken in the connections of the truss that run through, I really can't say that I would make that a tension-compression member. And in fact this could very readily be the design that would be most efficient there because of the fact that you have a possibility of running a continuous truss through there.

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